

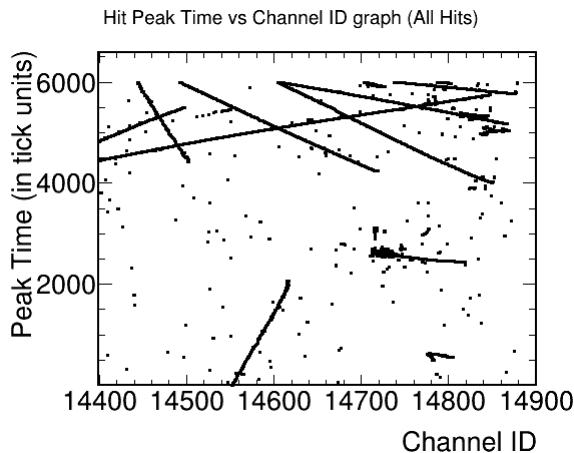
PNS Working Group Update

Jingbo Wang

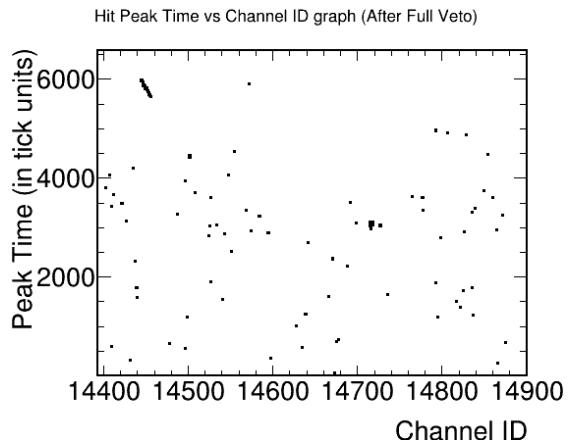


DDG Analysis: LArSoft Reco

- Data was taken over 10 days with different trigger modes and neutron intensities
- Main goal: verify the neutron transport model and develop neutron capture analysis algorithms

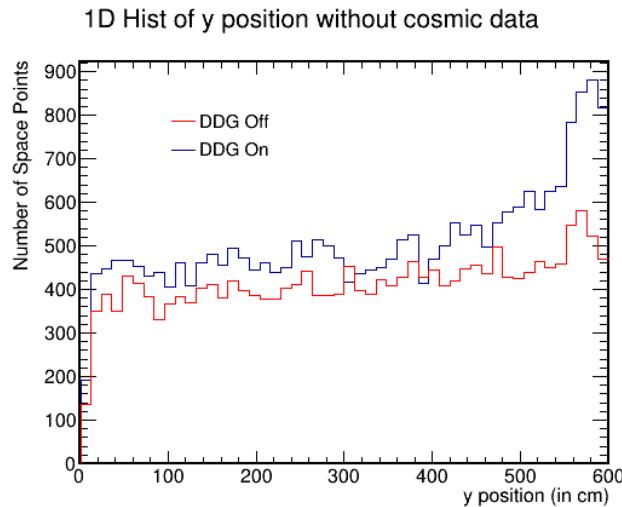


Peak Time vs Channel ID plot for one event;
Before and after cosmic removal respectively



Presented in NeuTel
by Y. Bezawada

Vertical space point distribution

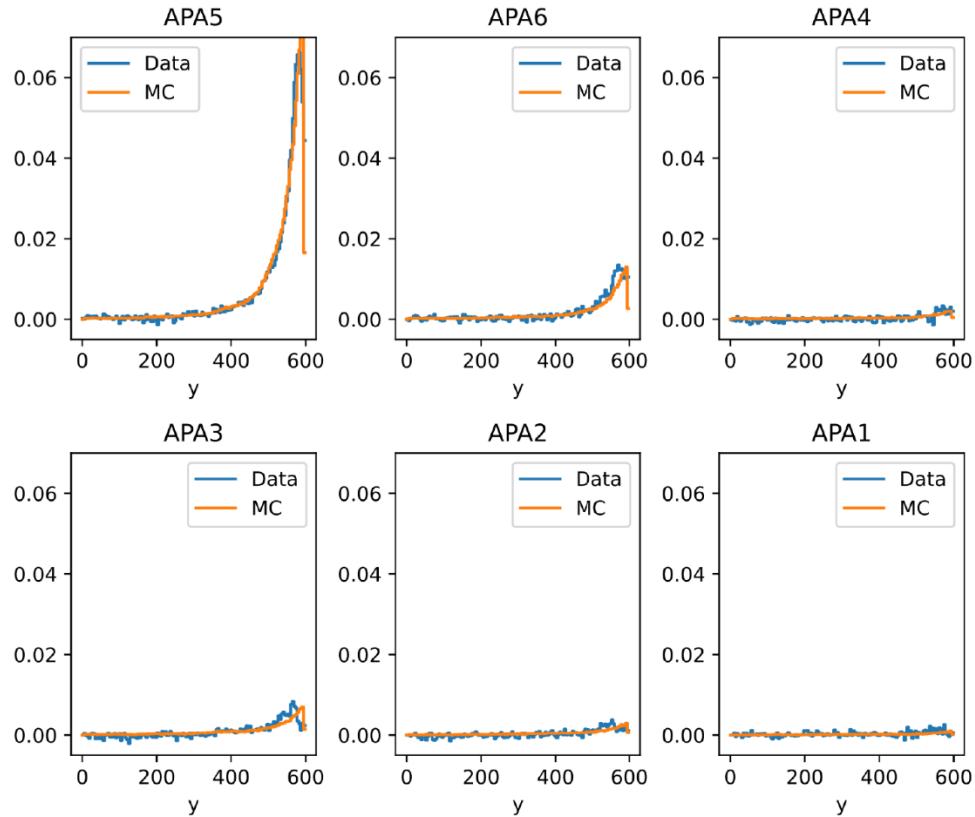


DDG Analysis: Deep Learning



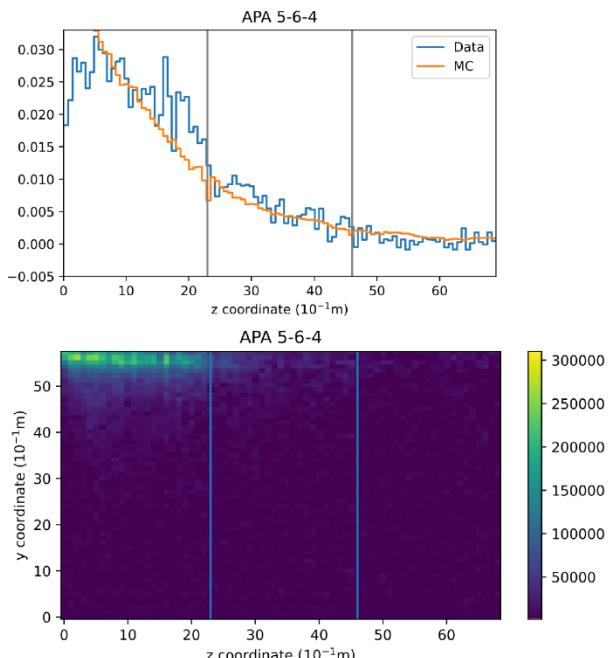
- The deep learning technique is able to find neutron low energy interactions: it will be a powerful tool for the DUNE experiment.

Vertical coordinate



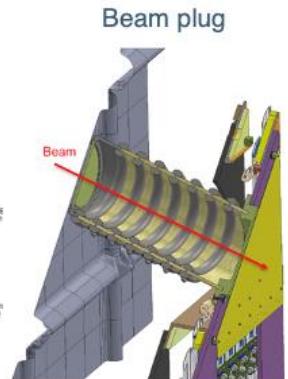
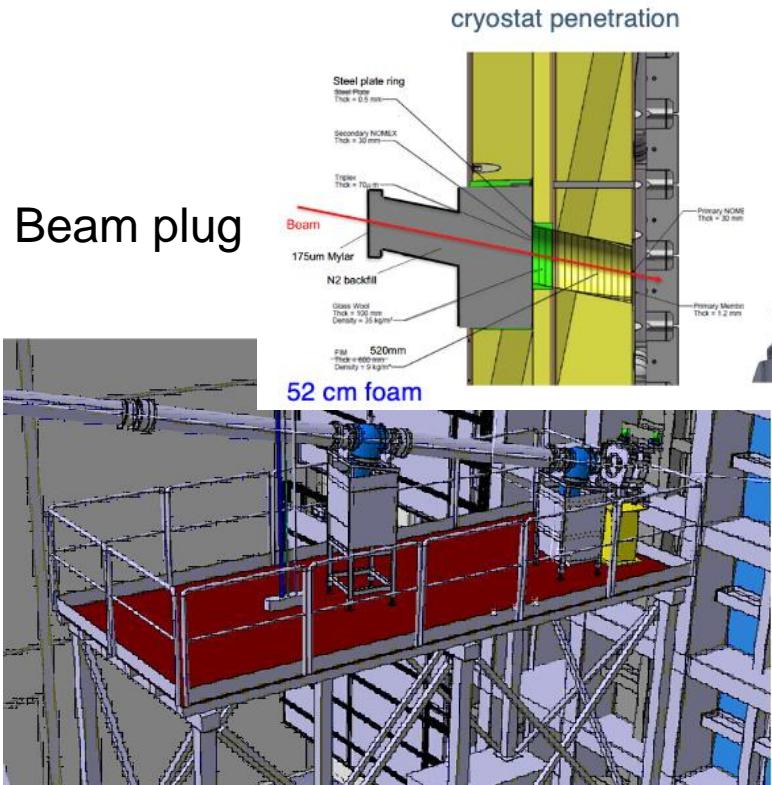
Presented in CALCI
meeting by Lorenzo
Ubaldi

Transversal coordinate

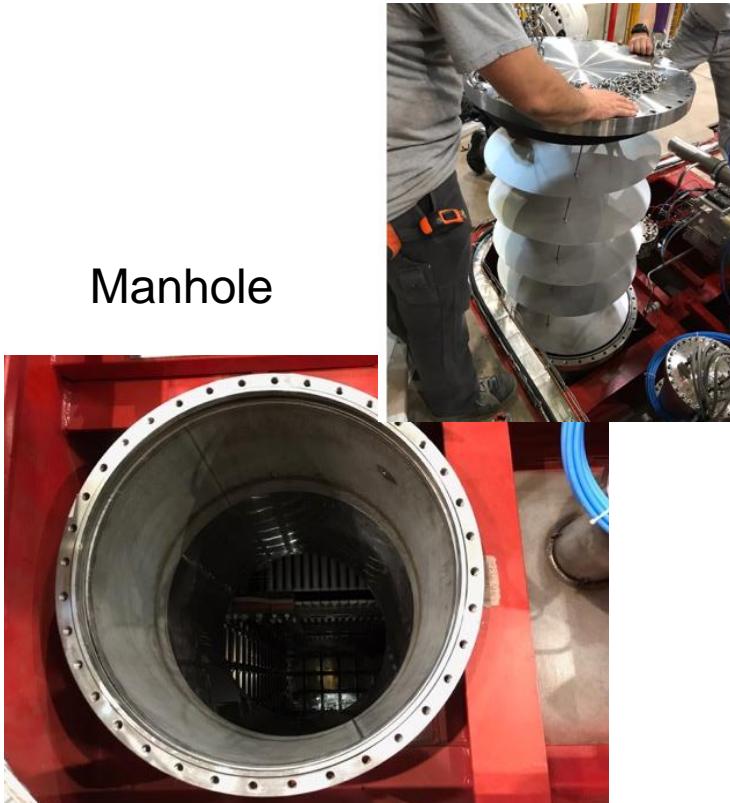


PortoDUNE Run-II Plan

- Option 1: using the beam plug results in more neutron captures inside the active TPC volume.
- Option 2: using the manhole will test the actual deployment planned for the far detector



Manhole



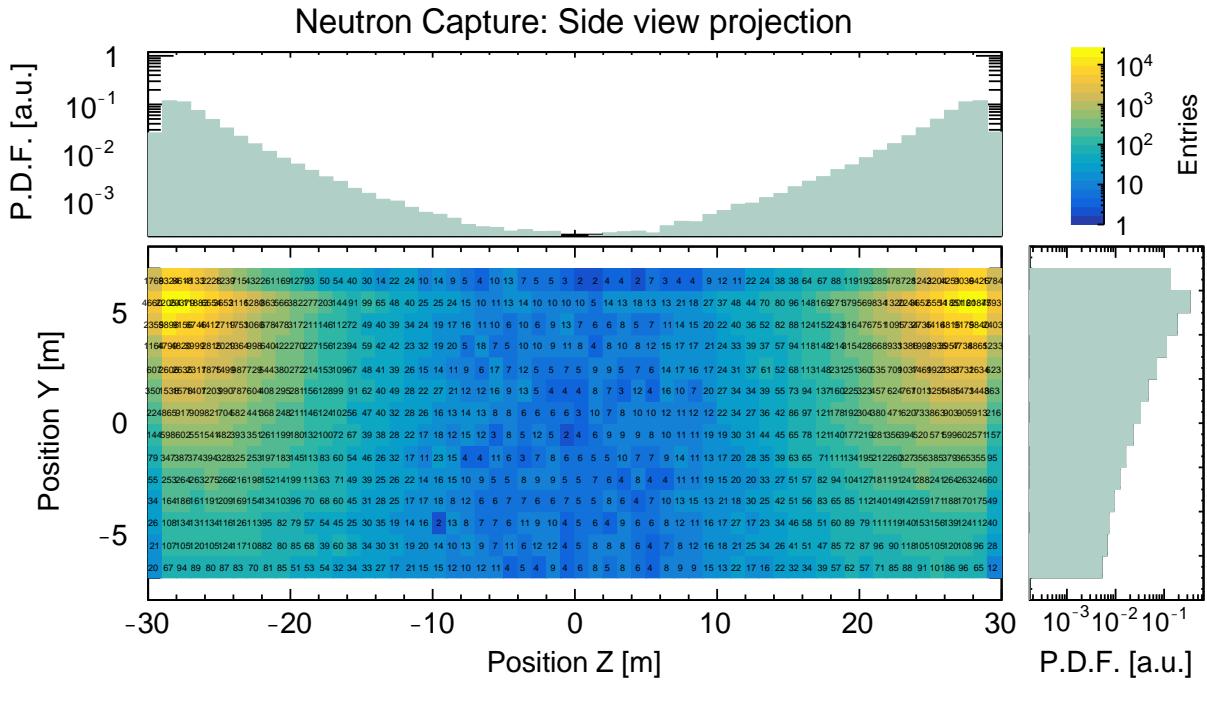


Simulation for beam plug

- Beam plug location (original plan)
 - neutron capture yield inside the active TPC is 0.37% (confirmed by both Larsoft and Geant4)
- Roof feedthrough location (chosen for DDG test at CERN):
 - In the middle: neutron capture yield inside the active TPC is 0.19% (Geant4)
 - At the corner: neutron capture yield inside the active TPC is 0.11% (Geant4)

Simulation for manhole

- The DD generator could be placed inside the manholes to get the maximum primary neutron flux (x5 increase), which leads to a much higher neutron capture yield inside liquid argon.
- No moderator is needed



- DD generator yield: 10^5 per pulse (100 μ s)
- DAQ Rate: **0.5 Hz**
- Run time: 3.3 minutes
- DD Pulses: 100
- DD neutrons: 2×10^7
- Neutron capture yield:**
 $\sim 4.4\%$ (X34 higher than TDR result)
- Neutron captures: 440618



Hardware Update

- The LANL DD generator will be shipped back to SD Mines for building the PNS prototype. Modification is needed in the control electronics to reach 1Hz pulse rate.
- Will place an order to purchase the shielding materials. Geant4 simulation has been done (by Walker Johnson at SD Mines) for several shielding options

ARTIE Analysis

- Reprocessed the ARTIE data with all data selection cuts.
- Both systematic and statistical errors were carefully analyzed.
- Toy MC simulation was performed to convolute the ENDF database with moderator response
- Last thing: double-check the background analysis (tiny effect at the region of interest)

